

A Peculiar Condition of Iron

319

which seems to be one of some importance. An iron wire curved into a fork is made to touch at its bend a wire provided with an oxidised end; in this state of contact both are introduced into nitric acid of sp. gr. 1.35 and 30°, so as first to immerse in the acid the oxidised end; the fork will, of course, not be affected. If now a common iron wire be put into the acid, and one of the ends of the fork touched by it, this end will immediately be acted upon, whilst the other end remains passive; but as soon as the iron wire with the oxidised end is put out of contact with the bend of the fork, its second end is also turned active. If the parts of the fork rising above the level* of the acid be touched by an iron wire, part of which is immersed and active in the acid, no communication of chemical activity will take place, and both ends of the fork remain passive; but by the removal of the iron wire (with the oxidised end) from the bend of the fork this will be thrown into chemical action.

As all the phenomena spoken of in the preceding lines are, no doubt, in some way or other dependent upon a peculiar electrical state of the wires, I was very curious to see in what manner iron would be acted upon by nitric acid when used as an electrode. For this purpose I made use of that form of the pile called the *couronne des tasses*, consisting of fifteen pairs of zinc and copper. A platina wire was connected with (what we call) the negative pole of the pile, an iron wire with the positive one. The free end of the platina wire was first plunged into nitric acid sp. gr. 1.35, and by the free end of the iron wire the circuit closed. Under these circumstances the iron was not in the least affected by the acid; and it remained indifferent to the fluid not only as long as the current was passing through it, but even after it had ceased to perform the function of the positive electrode. The iron wire proved, in fact, to be possessed of all the properties of what we have called a passive one. If such a wire is made to touch the negative electrode, it instantaneously becomes an active one, and a nitrate of iron is formed; whether it be separate from the positive pole or still connected with it, and the acid be strong or weak.

But another phenomenon is dependent

upon the passive state
of the iron, which phenomenon is in
direct contradiction with
all the assertions hitherto made by
philosophical experimenters.
The oxygen at the anode arising from the
decomposition of water
contained in the acid does not combine
with the iron serving as
the electrode, but is evolved at it, just in
the same manner as
if it were platina, and to such a volume
as to bear the ratio of